इंटरनेट मानक

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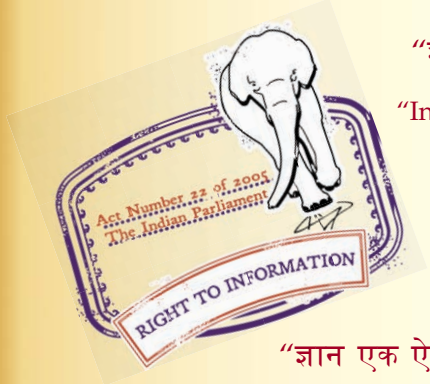
IS 4770 (1991): Rubber Gloves - Electrical Purposes [PCD 13: Rubber and Rubber Products]



"ज्ञान से एक नये भारत का निर्माण"
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"Invent a New India Using Knowledge"

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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IS 4770 : 1991
(Reaffirmed 2012)

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(पहला पुनरीक्षण)

Indian Standard
RUBBER GLOVES - ELECTRICAL PlJRPOSES - SPECIFICATION
(First Revision)

Second Reprmt fl'l Y 2008
(Includuu. vnundru, nt No I)

UDC 685 15 6213 781

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADIJR SHAH ZAFAR MARG
NEW DELHI 110002

August 1991

Price {;roup 7

AMENDMENT NO. 1 FEBRUARI 2001
TO
IS 4770: 1991 RUBBER GLOVES - ELECTRICAL PURPOSES - SPECIFICATION

(First Revision)

[*Page* 3, *Table* 2, 51 No.(ii) J - Subsutute the Iollowmg for the exisnng matter:

(1)	(2)	(3)	(4)	(5)	(6)
ii)	Tensile stress al 200 percent elongation, MPa, *Max*	2 1	2 1		3400 (Part 1) 1987

(PCD 13)

FOREWORD

This Indi.m St.md.u d (Fu st Revivrou) was adopted by the Bureau of Indi.m Standards, after the draft fin ihved hy the R ihber Products Sectional Committee had been approved by the Petroleum, ('oJI .md Related Products D1\isron Council

Rubber gloves fOI electr rcal purpose- after protection to workers from electnc shocks while working on energized conductors and equipment lIowever, It does not imply that rubber gloves shall be the only means of protec non for those working on elect: ical closed cirCmts Of corn ponents All possible precautions shall be taken againvt the hazard of shock and whvncvcr povviblc the CIfCUits should be disconnected

This standard was firvt pu bh-hcd In]968 and pi cscu bed four types of gloves suitablc for 1l13XIrnum working potential of 650, I 100, 3 300 .md 4 000 volts In this revrvron requirements of Type 3 and Type 4 gloves have been modified to make then} suitable 101 working potential up to 7 SOO and 17 000 volts respectively

ln actual pracucc the woI kcrv are requu ed to work on enct grzcd cqurpments only III cases where the working potentials arc of the order of 415 V and wuh loose fittings gloves It is very difficult to grip the objects In this revrsion close nttrngs thinner gloves have been prescribed for working potentials up to 650 V to have high degree of flevibrhty

I'hc double test prescribed for the electrical properties covers addiuonal safety factor and takes Into aceo unt eITect o f storage In hunud condit1011 WhilC,l rcasonab1c 11fe haS been ensured by the various tests p ovided, It is recommended that the gloves should not be unnec cssar.ly exposed to heat or light, or allowed to come In contact with solvents, oils, grease, turpentine, motor vpmts or strong acid and are not to be stored In cont.uner-, whell h.ivc deleterrou-, effect nn rubber

Length of the gloves IS given m cla usc 5.4 and typical drmensions tOI the popularly used sizes 8, 9 and 11 are given in Annex A Guidance for care, maintenance. Inspection, re-test and use of rubber gloves is given 111 Annex B

I his sta ndard cont.nns clause 7.1 wlnch calls for agreement between the purchaser and the supplier.

l-or the purpose of decid: ng whether a particular requi rernent of this standard IS complied with, the final val ue obvei \cd or calculated, exPI essmg the IC-u It of a test or analysis, shall be rounded off 111 acco d ince with IS 2 1960 'Rules for rounding off numenc.il values *i revtsed)'* The number of vrgmfic.int places ret.uned In the rounded off value should he the sarne as that of the specified \ alue In tlus standard

Indian Standard

RUBBER GLOVES - ELECTRICAL PURPOSES — SPECIFICATION

(First Revision)

1 SCOPE

This standard prescribes requirernentv, methods of sampling and test for rl1bbcr insulating gloves for electrical purposes.

2 REFERENCES

The followi ng Indlan Standards are necessary adjuncts to this standard:

IS No	*Title*
1876 . 1961	Method for voltage meavure-ment by means of sphere-gaps (one sphere earthed)
1885 (Parts 1 to 06)	Electrotechnical vocabulat y
3400	Methods of test for vulcani/cd rubbers:
(Part I) : 1987	Tensile stress--strain properties *(second revision)*
(Part 4) . 1987	Accelerated ageing (*second revision*)
(Pal t 13) : 1983	Tension set (*li, st rc1tsion*)
(Part 17) : J974	Tear strength -- angular test pieces
(Part 20) . 1977	Resistunce to ozone
3708	Metl,0 ds or test Iornaturaj rubber latex:
(IJal t 8) : 1986	Determination of total nitrogen (NRL : 12) *(first reviston)*
(Part 9) : 1986	Deteuninauon uf total ash (NRL : 16) *i firs] revIsIon)*
7503 (Parts I to 6)	Glossary of terms used In rubber industry

3 TERMINOLOGY

3.0 For the purpose of tlus standard, the definitions given in various parts of IS 1885, IS 7503 and the following shall apply.

3.1 Type Tests

1 ests carried out to prove conformity with the speciticarton. These are intended to prove the general qi.aliues, desjgn and raw materiul of a given type of gloves.

3.2 Acceptance Tests

Tests carried out on samples taken from a lot Ior the purpose of acceptance of the lot.

3.3 Routine Tests

Tests carried out at manufacturer's works on each glove to check the requirements which are likely to vary during production.

4 TYPES

4.1 This standard cover following four types of gloves:

Type J — For use at voltage not exceeding 650 ac rrns

Tvpe 2 - For use at voltage not exceeding 1 100 ac rms

1)'Pe 3 - For use at voltage not exceeding 7 500 ac rrns

Type 4 .- For use at voltage not exceeding 17 000 ac rrns.

4.1.1 Type 1 glovcs shall be the wrist type (close fitting), wlule Type 2, Type 3 and Type 4 shall he guuntlct type.

5 REQlJIREMENTS

5.1 Composit ion

5. 1.1 Typc 1 gloves shall be rnade from good quahty natural rubber.

5.1.2 Type- 2, 3 and 4 glovc-, shall be made from good quality natural or vynthetrc rubber or frorn a mixture thereof.

5.2 Construction

The gloves shall be made either by dipping, If latex is used or trom calendered sheets. The gloves shall have a vruooth finish and the cutf edges shall be finished with a roll or a reinforcmg strrp of rubber, unless specified otherwise.

If gloves are made from calendered sheets, all joints shall be made by butting or skiving the edges closely together and strengthening both sides by means of strips or tapes of the sam-: material as the sheets These shall be suitabtv vulcanized to conform to (he requirements of thc spee: f catIon.

5.3 Shape and Sire

'1ype t gloves shall be of the sh., pe as given j<: Fig. 1 and Iype-, 2 to 4 gloves shall be of loos. fitting shape as given in Fig 2. The recommended sizes are given In Annex A.

5.4 **Length**

The minimum internal length from the tip of the second finger to the edge of the cuff shall be *2S0* mm for the wrist type and 400 mm for gauntlet type"

5.5 Thickness

The thickness of the gloves when determined as in Annex C shall meet the requirements specified in Table 1.

Table 1 Tbickness of Gloves

(Clause 5.5)

Type	Mlnlmuna Thickness at		Maxlmum Thickness
	Crotch' Area	Non-crotch Area	(Both)
(1)	(2)	(3)	(4)
	mill	mm	1111\1
1	0"SO	0·55	0'95
2	0'70	0"SO	1"25
3	O'SO	0·95	1·50
4	1'05	t·30	2'30

lCrotch area is a cucular area 12 5 mm radius whose centre is at Intersectlon of the plane of the axis of the fingers (or thumb) and a lines at the crotch, midway bctween the base of the adjaccnt fingers (or thumb) and extendins from palm to the back of the glove.

5.6 The gloves shall have a smooth surface and shalt he free on both inner and outer surfaces from visual defects like patches, blisters, porosity, embedded foreign matter or other physical defects which may be detected at the time of inspection or testing.

5.7 The rubber forming the gloves and also the seams. in case of gloves that are built up from sheet, shall comply with requirements given in Table 2.

5.8 Proof (Test) Voltale aDel Leak_Ie Current

Each glove shall withstand the *SO* Hz ac proof (test) voltage (rms value) according to the method prescribed in Annex F. The test voltage shall be applied continuously for 1 minute and the glove shall withstand it without breakdown and the leakage current aball not be more than as prescribed in col 6 of Table 3.

5.9 Breakdown Voltage

Gloves when tested according to the method prescribed in Annex G, shall not breakdown at voltage below the value shown against each type in Table 4.

NOTE - The 810vcs subjected to breakdown test aball NOT be used for electrical protection any more.

5.10 Ozone Reslstance

Type 4 gloves shall show no visible defects when tested in accordance with Annex H. Any visible sigDs of ozone deterioration of the glove material, such as, cracking, pittin" breaks. etc, tball be considered as failure"

6 TESTS

6.1 Clasllfieatlon of Tests

6.1.1 Type Tesls

The following shall constitute type tests:

a) Thickness (*see* **5.5**);
b) Tensile strength (*see* **5.7**);
c) Elongation at break (*see* **5.7**);
d) Tension set (*see* **5.7**);
e) Tensile stress at 200 percent elongation (*see* **5.7**);
f) Tear strength (*see* 5.7);
g) Tensile strength and elongation at break after heat ageing (*see* **5.7**);
h) Puncture resistance (*see* **5.7**);
j) Moisture absorption (*see* 5.7);
k) Nitrogen content (for natural rubber only) *(see* 5.7);
m) Ash content (for natural rubber only) *(see* **5.7**);
n) Proof voltage and leakage current (*see* **5.8**);
p) Breakdown voltage (*see* 5.9); and
q) Ozone resistance (for type 4 only) (*see* 5.10).

6.1.1.1 Five samples shall be submitted for testing. The testing authority shall issue a type approval certificate, if the gloves are found to comply with the requirements as given in 6.1.1.

6.1.1.2 In case of failure in one or more type tests, the testing authority may call for fresh samples not exceeding twice the number of original samples and subject them to the testes) in which failure occurred. If, in the repeat tesns) no failure occurs, the tests may be considered to have been satisfied.

6.1.2 Acceptance Tests

The following shall constitute acceptance test:

a) Thickness (*see* **5.5**),
b) Tensile strength and ultimate elongation (*see* 5.7).
c) Puncture resistance (*see* **5.7**).
d) Moisture absorption (*see* 5.7).
e) Proof voltage and leakagecurrent (*see* 5.8).
f) Breakdown voltage (*see* **5.9**).

6.1.2.1 The number of samples for acceptance testa shall be as specified. However, a recommended plan of sampling is liven in Annex J.

6.1.3 Rautine Tests

a) Thickness (*see* **5.5**).
b) Proof voltaic and leakage current (*see* 5.8).

Table 2 Requirement. lor Material Formlul the Gloves
(Claus, 5.7)

81 No.	Characteristic	Requirement		Method of Test, Ref to	
		Type 1	°fypcl 2, 3 & 4	Annex of This Standard	Other
(1)	(2)	(3)	(4)	(5)	(6)
i)	Tensile strength, MPa, *Min*	17	)0		3400 (Part 1) : 1981
ii)	Tensile stress at 200 percent elongation, MPa, *Mill*	2	2		do
iii)	Elongation at break percent, *Min*	600	500		do
iv)	Tear strength, kN/m. *Min*	14	14		3400 (Part 17) : 1974
v)	Tension setl), percent, *Max*	20	25		3400 (Part 13) : 1983
vi)	Moisture absorption mg/cm, *Max*	5	5	D	
vii)	Change in tensile strength, after accelerated ageing at 70 ± 2°C for 168 h percent of original, *Mill*	80	90		3400 (Part 4) : 1987; and 3400 (Part 1) : 1987
viii)	Change in elongation at break, after accelerated ageing at 70 ± 2°C or 168 h, percent of ortginal. *Min*	80	80		do
ix)	Puncture resistance, kN/m	18	18	E	
x)	For natural rubber only				
	a) Nitrogen content, percent of dry rubber content, *Max*	0'2			3708 (Part 8) : 1986
	b) Ash content, percent, *Max*	1"0			3708 (Part 9) : 1986

1) Extend the sample to 100 percent elongation for a duration of to minutes and recovery time of 30 minutes then measure the final length between the bench marks.

Table 3 Proof (Test) Voltage aDd Leak-Ie Current Requirements
(Clause 5.8)

SI No.	Type *01* Glove	Working Voltage (rms) of Gloves, *Max*	Proof (Test) Voltage (rm,)	Leakage Current (rms) at Work.. ing Voltage, *Max*	Leakage Current (rms) at Proof Voltage
		V	V	µA	rnA
(J)	(2)	(3)	(4)	(5)	(6)
i)	1	650	5000	400	4
Ii)	2	1 100	JOOOO	600	8
iii)	3	7 *SOO*	17000	4000	14
iv)	4	17000	25 000	8000	16

Table 4 A.C. Breakdown Voltage Requirements
i Clause 5.9)

SI No.	T)'pe of Glove	Minimum Breakdown Voltage (V) (rms), *Mill*
(1)	(2)	(3)
i)	1	6000
H)	2	12000
iu)	3	20000
iv)	4	30000

7 PACKING AND MARKING

7.1 Packia.

The gloves may be packed in polyethylene baas and sealed or as agreed to between the purchaser and the supplier.

NOTE - Materials, such as copper. manganese and substances which are oily greasy Or farry in nature have deleterious effect on rubber. Containers with internal surfaces made Or such materials should, therefore be avoided.

7.2 Marking

The gloves shall be marked indelibly at the back with the following information:

a) Size and type of glove;

h) Maximum "working potential in bolts, followed by the word workina· in brackets;

c) Indcntiflcation of the source of manufacture; and

d) Month and year of manufacture.

7.2.1 The gloves shall be colour coded as given below to indicate the rated potential:

Black for Type 1

Blue for Type 2

Green for Type 3

Red for Type 4

7.2.2 The gloves may also be marked with the Standard Mark.

8 TIME LAPSE BETWEEN RECEIPT OF MATERIAL AND TESTING

8.1 For all the test purposes, the minimum time between vulcanization and testing shall be 16 h.

8.1.1 For product tests, whenever possible, the time between vulcanization and testing should not exceed 4 months. In other cases, tests shall be made within 2 months from the date of receipt of the product by the customer.

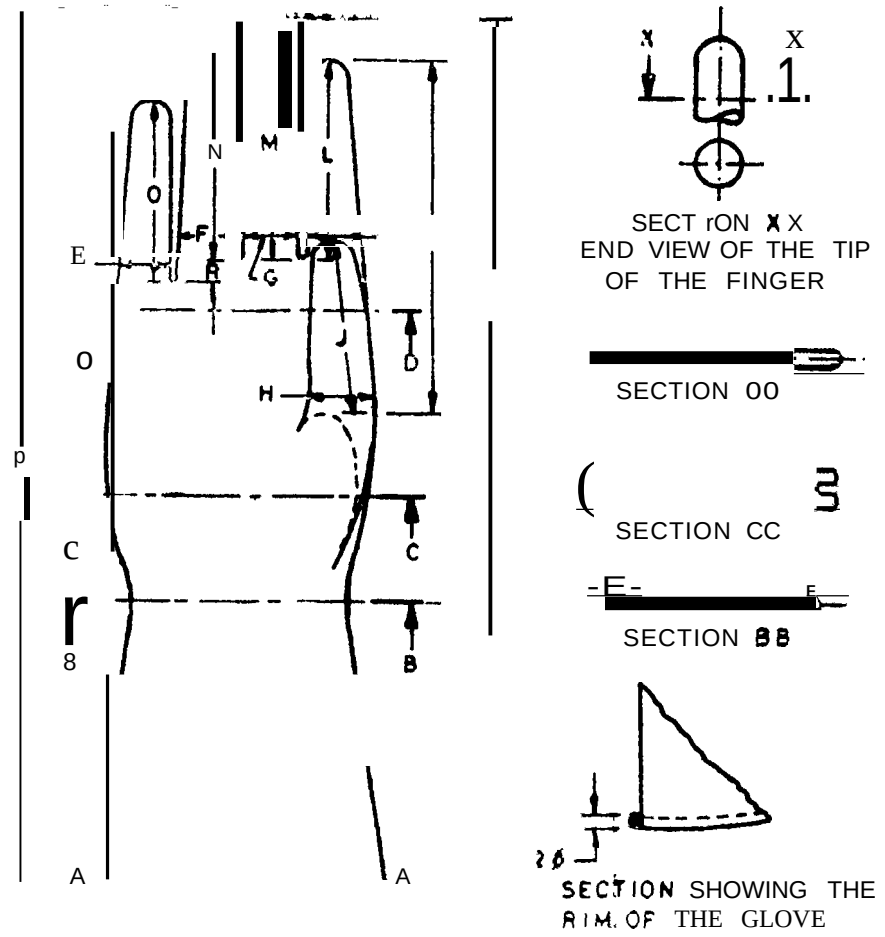
9 TEST PIECE

9.1 Wherever possible, for all tests, teat pieces shall be cut from the finished article. Where this is not possible, the manufacturer shall provide test slabs from the same batch of rubber compound and vulcanized to the same degree and in the same manner as that of the rubber from which gloves have been manufactured.

ANNEX A
(*Clause* 5.3)

RECOMMENDED DIMENSIONS FOR DIFFERENT SIZES OF RUBBER GLOVES FOR ELECTRICAL PURPOSES

A-I The recommended dimension of various parts of Type I glove shown in Fig. I are given in Table 5.



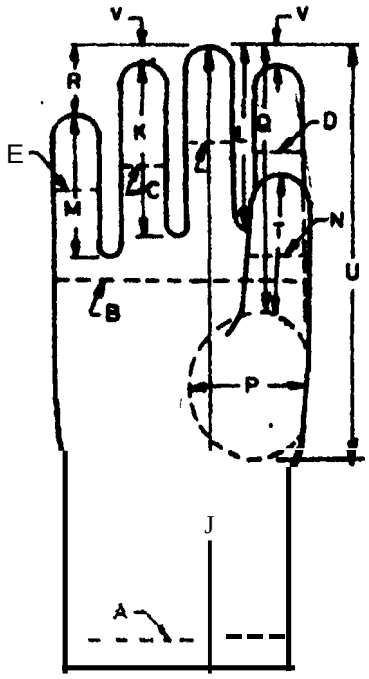
FIO. I DIMENSIONS FOR RIGHT HAND RUBBER GLOVE (TYPE I)

Table 5 **Recommended Dimensions** For **Type** 1 **Gloves**
(Clause A-I)

51 No.	Description	Dlmenaion	Tolerance
(I)	(2)	(3)	(4)
		rom	mm
1	Perimeter at *AA*	210	± 3
2	Perimeter at *BB*	185	± 3
3	Perimeter at CC	240	± 3
4	Perimeter at *DD*	205	± 3
S	Circumference at *E*	60	± 2
6	Circumference at *F*	63	± 2
7	Circumference at *G*	65	± 2
8	Circumference at *H*	70	± 2
9	Length at *J*	6l	± 2
10	Length at *K*	120	± 2
11	Length at Land *N*	72	± 2
12	Length a1 *M*	82	± 2
13	Lcn.lh at *0*	62	± 2
14	Length at *P*	280	± 3
15	Length at *Q*	lOS	± 3
16	Length at *R*	9	± 1

NOTE - All the dimensions given here are outside dlmensions, Circumference at *E. F. G* and *H* IS to be measured at a point 5 mm less than the length of the respective finger as measured from the tip.

A-2 The recommended dimensions of various parts of Types 2 to 4 glove shown in Fi., 2 are given in Table 6,



FIG, 2 OUTLINB OF GLOVS AND RECOMMENDED INTERNAL DIMENSIONS (TyPES 2 TO 4)

Table 6 Recommended Internal Dimensions

(Clause A-2)

		Description	Size		
			8	9	11
		(1)	(2)	(3)	(4)
			mm	mm	mm
Circumference at	1 J	*A*	2200	235'0	270'0
		B	220'0	235'0	270'0
		e[1])	58'0	62'0	70'0
		DI)	60'0	65'0	75'0
		£1)	55'0	60'0	70'0
		N[1])	700	80'0	90'0
		Wrist. *Min*	265'0	265'0	265'0
		a.untle'. *Min*	355'0	355'0	355'0
Length at	1 J	*K*	65'0	70'0	80'0
		L	75'0	80'0	90'0
		M	55'0	60'0	67'0
		P[2])	45'0	50'0	55'0
		Q	1100	11"0	130'0
		R	28'0	30'0	33'0
		T	57'0	60'0	65'0
		U	170'0	178'0	195'0
		V	9'0	9'0	JO'O

1) Circumference i. measured half-way between crotch and tip,

') Applies to built-up Ilovel only,

ANNEX B

(S'ee Foreword)

CARE, MAINTENANCE, INSPECTION, RE-TEST AND USE OF RUBBER GLOVES FOR ELECTRICAL PURPOSES

0-0 GENERAL

8-0.1 This annex relates to the maintenance of gloves after purchase.

D-I STORAGE

Each pair of gloves shall be stored unfolded in a separate container') in a dry, dark and cool place where the temperature is preferably about 27 ± 2°C. Gloves which have been issued for service but are not actually in use should be kept in their containers. which should not be used for any other purpose, or in such a place that they will not be easily subjected to mechanical or chemical damage.

B-2 ISSUING FOR USE

Gloves intended for linemen and outdoor workers should be issued in a protective container free from grease and oil, and of a type suited to the class of work for which they should be used. When the gloves are to be kept in tool boxes, they may be kept in fibre, wooden or other suitable material containers in order to protect from sharp tools or oils rags or cloth. Gloves issued for the sole purpose of emergency use shall be kept in waterproof containers.

8-3 EXAMINATION BEFORE USE

8-3.1 Before being, used, every glove *shall* be subjected to visual examination inside and outside (the inside is liable to be cut by finger nails). If, as a result of this examination, erther of the gloves is considered unsafe, the pair should be submitted for re-test.

B-3.2 Air Leakage Test

Subject each glove to air leakage test by gripping the cuff in each hand swinging the glove around itself so as to roll up the cuff and retain the air in the glove, Glove found defective or suspected to be defective shall not be used.

8-4 PRECAUTIONS IN USE

B-4.1 Gloves shall not be unnecessarily exposed to heat or light or allowed to come into contact with oil, grease, oil of turpentine, motor spirit or strong acid.

B-4.2 When protector gloves are used. they shall be worn over the rubber gloves. If the protector gloves become damp. oily, or greasy. they should be removed. Protectors should be removed from the rubber gloves when these are not in use.

8-4.3 Gloves become soiled by different materials like dust, insulating compounds, paints. corrosion products of copper (overhead lines) and occasionally by transformer oil.

8-4.4 Dust may be removed by washing and brushing with soap and water. Gloves that have come in contact with copper have to be cleaned carefully by means of washing and brushing. Gloves thus cleaned should be rinsed thoroughly with clean water and have to be dried thoroughly by means of heated air (maximum temperature 65°C) and dusted with talc powder.

8-4.5 For removing Insulating compounds. paints and other materials the gloves should be quickly wiped with solvents like acetone, carbon tetrachloride or trichloroethylene and then immediately washed and treated as in 8-4.4. Motor spirit, petroleum hydrocarbon solvent shall not be used to remove such compounds.

B-4.6 Any glove which becomes wet in use shall be thoroughly dried. Where heated air is blown into the glove. it should not cause the temperature of any glove to exceed 65°C.

U-S INSPECTION AND RE-TESTING OF GLOVES

Gloves issued for frequent use *shall* be re-tested intervals of not more than 6 months. Gloves issued for occasional use shall be re-tested after use or in any case at intervals of not more than 12 months.[1] Gloves kept in stores should be re-tested at intervals of not more than 12 months. Surface defects, not visible on initial acceptance test and inspection may develop with use, resulting from the breaking of blisters in the rubber or front foreign matter breaking through the surface. All gloves which show any defects when returned after use shall be rejected and destroyed. Each glove shall be stretched by hand to ensure that mechanical strength is adequate, Those which appear to be in good condition shall be re-tested as follows:

a) The gloves are given a single electrical test in accordance with the appropriate test potential as specified in Table 3 (that is. according to the rated potential) and in the manner described in Annex F.

b) In the re-test no glove shall break down or show a current leakage in excess of the maximum specified in Table 3 whichever is appropriate.

1) Certain matcnals, such as copper, manganese and substances which are oily, greasy, Or tarry in nature have a deleterious effect on rubber. Containers made of or contain! ng such materials on their interior surfaces should. therefore, be avorded,

Only those gloves that pass this test shall be accepted as satisfactory and shall then be trea'ed in the manner described in B-4.6, all other gloves shall be rejected and destroyed.

B-6 SALVAGE

When only one glove of a pair is rejected, the other where possible, may be re-mated with a similar glove of the same size and make; the resultins palr, after re-testing, may be placed in serviceable stock. No glove shall be turned inside out for re-mating.

ANNEX C

(Clause 5.S)

MEASUREMENT OF ·THICKNESS

C-i APPARATUS

C-l.1 Dial Gaule

A micrometer dial gauge, graduated so as to read accurately to the nearest 0'02 mm.

C-1.2 Procedure

Measure the thickness of each glove at not lesl than four points at tho back and four points on the fore part of the palm. Take also measurements at one .or more points in the crotch between thumb and index finger and in the crotches between the finger.. The thickness measured shall fall within the maximum and minimum limits specified in Table I.

ANNEX D

[*Table* 2, *SI. No* (vi)]

METHOD OF TEST FOR MOISTURE ABSORPTION

D-1 APPARATUS

D-1.1 Analytical Balance

Capable of weighing to 0·001 g.

D-1.2 Olen

Capable of DlaintainiDI uniform temperature of 50 ± 3·C and 70 ± 1°C.

D-2 TEST SPECIMEN

A bar 75 mm x 25 mm having the tbickne'l of material.

D-3 CONDITIONING

Condition three specimens 0r materials in air oven for 24 h at 50 ± 3°C, cool in a desiccator and immediately weigh to the nearost 0·001 g.

D-4PROCEDURE

D-4.1 Place the conditioned specimens in a container of distilled water at a temperature of 70 ± ioe for 48 ± 2 b supported on edge and entirelyimmersed. At the end of the period, remove the specimens from the water and cool at room temperature. Remove ailiurface water with a dry cloth, and weigh the specimens to the nearest 0·001 g immediately.

D-5 CALCULATION AND REPORT

Increase in mass, $mg/cm^2 = \frac{(M. - MI)}{A} \times 1000$

where

MI = mass, in g, of conditioned specimen;

M. = ma••, in g, of specimen after immersion; and

A = area, in cm^2, of specimen.

The report shall include the 8veralc for three specimens .a (ollows:

a) Increase in mass durioa immersion, and

b) Any observations as to warpiDJ. crackina or change in appearance of specimens.

ANNEX E
[*Table* 2, 81 *No.* (ix)]

METHOD OF TEST FOR PUNCTURE RESISTANCE

E-I APPARATUS

E-l.1 Universal Test Macblne

of minimum capacity 1 kN with an accuracy of .:tIN

E-1.2 Two Flat Meta) Plates Having Concentric Openings

One of the plates shall have a Circular opening 6 mm In diameter to allow the passage of a stainless steel needle. The other plate shall have an opening 25 mm In diameter to provide a fixed free area through which specrmen may elongate while being subjected to the pressure of the needle pomt The edges of the opening shall be rounded to a radius of approximately 0 8 mrn

The needle shall be made from 5 mm diameter type 304 stainless steel rod. The rod shall be machined at one end rounded to a radius of 0'8 rom

E-2 TEST SPECIMEN

At least 40 mm x 40 mm size.

E-3 PROCEDURE

POSItion the needle perpendicular to the specimen on the tensile testing machmg so that the point contacts the specimen through the small hole In the plate. Drive the needle through the specimen at a rate of approximately 10 mm/sec. Measure the maximum force required to perform the punctu-ring operation to the nearest 2 N

ANNEX F
(*Clause* 5.8)

METHOD OF TEST FOR PROOF (TEST) VOLTAGE AND LEAKAGE CURRENT

r-r VOLTAGE MEASUREMENTS

F-J.t Apparatus

The apparatus shall eonsrst of the following

a) A source of alternanng clectncal current. approximately 50 cycles per second and of approximately sine wave-form

b) A step-up transformer having one end of the secondary Winding earthed The ratio of the peak potential to the rrns potentia) of the secondary Winding of the transformer IS Within the limits of $\sqrt{2} \pm 5$ percent of $\sqrt{2}$ (1-34 to 148) under the test conditions The rating of the testing set IS not more than 2 kYA and not Jess than 1/2 kVA per glove being tested.

c) SUItable controlgear and means for Input voltage variation.

d) *Potential* (*Voltage) Measuring Equipment*>- This may be a peak or other typo of voltmeter connected across the input winding, output winding or a special voltage Winding or across a porting of the output Winding. Any instrument used should be cahbrated against a sphere gap in parallel With a load equivalent to the normal test load. Any rms Instrument may, however, be calibrated against a peak voltmeter, provided that there IS adequate evidence that the latter IS free from errors due, for example, to frequency changes, brush discharger or re-entrant waveforms (*see* IS 1876: 1961).

e) A rmllrammeter or other current-measuring equipment.

f) A bath in which the gloves may be immersed 10 tap water at a temperature of 27 ± 2°C.

g) Insuladng clips for suspendmg the gloves

F-1.2 Procedure

F-l.2.1 *Prepsratton for Test*

Clean before the commencement of each test, the cuffs of the gloves With Industrial alcohol In order to prevent flash-over occurring through water seeping along the chalked surfaces. Immerse each glove In tap water (at 27 ± 2°C) up to 40 mm from the edge ot the cuff and fill WIth tap water to the same level. Immerse the glove In this way for a period of I hour before test, Hold the glove in posiuon by means of insulating clips. The water Inside and outside the glove forms the Internal and external electrodes respectively Connect the Inner electrode to the hrgh voltage supply by means of chains or wires Earth the external electrode through the milhammeter CIrCUit.

F-1.2.2 Raise to potential apphed across the test electrodes from zero to the approxrmate rms test value as rapidly as IS consistent WIth its value being observed 011 the measuring Instrument but not less than 1 kV per second.

F-1.2.2.1 Test the gloves for the leakage current at the working voltage as indicated in Table 3 depending on the types of gloves and maintain this potential for one minute. Test for only break-down in voltage and measure the leakage current. The gloves shall not pass a current more than specified in the said table for such class during the last 15 seconds. Destroy the gloves which fail in above test.

F-1.2.2.2 For such gloves which meet the requirementain F-1.2.2.1 increase the voltage in the same set up from the working potential to the test potential indicated in Table 3 and maintain at that level for 1 minute. The leakage current shall not exceed the value mentioned for such class of gloves in Table 3. Gloves which fail in above test should be rejected.

F-1.3 **Results**

Report any sudden fall in voltage and read the leakage current from the reading of the current measuring instrument during the last I5 seconds.

ANNEX G

(*Clause* 5.9)

METHODS OF TEST FOR BREAKDOWN VOLTAGE (BDV)

G-I APPARATUS

G-l.1 The apparatus shall consist of the following:

a) A source of alternating electrical current, approximately SO cycles per second and of approximately sine wave-form.

b) A step-up transformer having one end of the secondary winding earthed. The ratio of the peak potential to the rms potential of the secondary winding of the transformer is within the limits of $\sqrt{2} \pm 5$ percent of $\sqrt{2}$ (1'34 to 1-48) under the test eonditlons. The rating of the testing set is not more than 2 tVA and not Jess than 1/2 kVA per glove being tests.

c) Suitable controlgear and means for input voltage variation.

d) Potential (voltage) measuring equipment. This may be a peak or other type of voltmeter connected across the input winding, output winding or a special voltage winding or across a porting of the output winding. Any instrument used should be calibrated against a sphere gap in parallel with a load equivalent to tho normal test load. Any rms instrument may. however, be calibrated against a peak voltmeter, provided that there is adequate evidence that the latter i. free front errors due, for example. to frequency changes, brush discharges or re-entrant wave-forms *(see* IS 1876: 1961).

e) A milliammeter or other current-measuring equipment.

f) A bath in which the gloves may be immersed in tap water at a temperature of 27 ± 2°C.

g) Insulating clips for suspending the gloves.

G-2 PROCEDURE

G-2.1 Preparation for **Test**

a) Clean the cuffs of the gloves with industrial alcohol before the commencement of each test in order to prevent flashover occurring through water seeping along chalked surfaces.

b) Immerse each glove in tap water at 27 ± 2°C to a depth of 40 mm from the edge of the cuff and fill with tap water to same level.

G-2.2 Apply telt voltage at 10 percent of the expected BDV of the glove and increase it at a rate of lkV/sec until breakdown occur or until 1·2 times the expected breakdown voltage hal been reached. Record the maximum voltage observed at breakdown.

ANNEX H
(*Clause* S.to)

METHOD OF TEST FOR OZONE RESISTANCE

H-l APPARATUS

See 3 of IS 3400 (Part 20) : 1977.

H-2 TEST SPECIMEN

100 mm x t50 mm specimen of the glove material.

H-3 PROCEDURE

"-3.1 Suitably condition the specimen by keeping flat for 24 h. Drape the specimen over a 25 mm diameter metal tube of sufficient length to completely underlie the specimen, while possessing additional length for the required mounting supports. Electrically ground the metal tubing clamp the free ends of the specimen beneath the tubing along the upper half of the cylindrically shaped electrode surface.

H-3.1.1 Place a piece of flat, 'aluminium sheet foil, approximately 50 to 100 rnrn, over the draped specimen so as to provide adequate separation distance to prevent flash-over between the foil and the metal test. Connect electrode wire to the aluminium foil.

H-3.2 Energize the outer electrode (metal foil) to 15 kV potentia1 from a suitably rated potential transformer energized from its low voltage winding through a conunuously variable auto transformer. Incorporate an over current protecting device into the low voltage control circuit for protection in case of an electrical breakdown.

H-3.3 Determine the ozone resistance of the specimen qualitatively by inspection. after 1 hour exposure period in the test apparatus at the IS kV potential. Test at least two specimens from each sample glove selected. Take two specimens fro01 the same section of the sample glove.

NOTE - The rate of ozone degradation is inversely proportional to the relative humidity of the surrounding air. Empmcal data indicate, however, that visible ozone effects are evident over a broad range of ambient humid.tles under these test conditions.

ANNEX J
(*Clause* 6.1.2.1)

SCALE OF SAMPLING,

J-l LOT

J-1.1 In a consignment of all the gloves of the same type, and manufactured from the same type of rubber under essentially similar conditions of production shall be grouped together to constitute a lot.

J·J.1.1 Samples shall be selected and tested from each lot separately for ascertaining its conformity or otherwise to the requirements of this specification.

J-2 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

J-2.1 Each glove in the Jot shall be examined for workmanship and tested for leakage current. The gloves failing to meet the requirements for workmanship or leakage current shall be rejected and only those which pass in these requirements sball constitute the lot for other tests.

J-2.2 The number of gloves to be selected at random from a lot shall depend upon the size of the lot and sball be in accordance with col 1 and 2 of Table 7.

J-2.2.1 The gloves to be selected from the lot shall be chosen at random. In order to ensure the randomness of selection, random number tables shall be followed.

In case random number tables arc not available, the gloves may be selected from the Jot in the following manner:

Starting from any glove in the lot, the gloves shall be counted as 1, 2 ... ", *r* and so on in one order. Every rth glove thus counted shall be withdrawn to constitute the sample. where *r* is the integral part of *Nln* (Nand *n* being the lot size and the corresponding sample size respectively). This procedure shall be followed till the required number of gloves for the sample are obtained.

J-2.3 All the gloves selected according to J-2.2 shall be examined for size, length and thickness. Any glove failing in one or more of these characteristics shall be considered as defective. If the number of defectives found in the sample is less than or equal to the corresponding permissible number given in col 3 of Table 7, the lot shall be declared as conforming to these requirements. otherwise 110t.

Table 7 Scale of Sampling and Pennlsslble Number of Defectives
(*Clause* J-2.2)

No.orGlov. In tbe Lot	For Size, Length and Thickness		For Remalnlo. Tests	
	Semple Size	Permis.ible No. of Defectives	Sub-sample Size	Permissible No. of Defectives
(1)	(2)	(3)	(4)	(.5)
N	*n*	*n*		
Up to *100*	8	0		
101 to 1.50	13	0	3	0
151 to 300	20	0		
301 to .500	32	1	6	0
501 to 1000	50	2		
1001 103000	80	3	9	0
3 001 lind above	125	5		

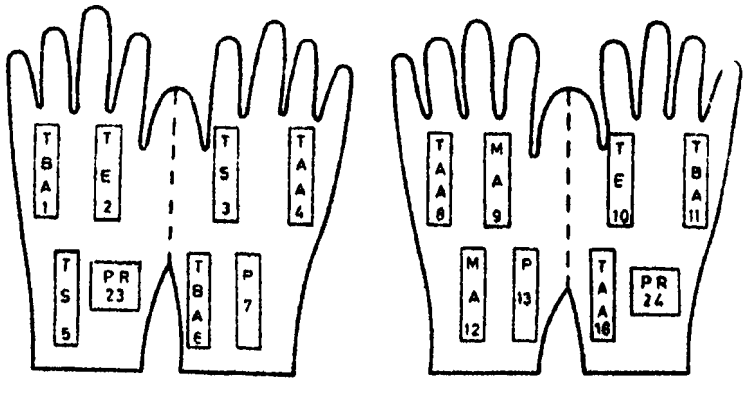
J-2.3.1 In the case of those lots which have been found unsatisfactory according to J-2.3, all the aloves may, depending upon the agreement between tbe purchaser and the supplier, be inspected for these characteristics and the defective ones removed.

J-2.4 The lot having been found satisfactory for size, length and thickness shall be tested for all the other tests. For this purpose a sub-sample of size given in col 4 of Table 7 sball be taken at random and first subjected to the minimum breakdown vllJtage test. All tbe gloves in the sub-sample shall pass the test for the lot to be declared as satisfactory.

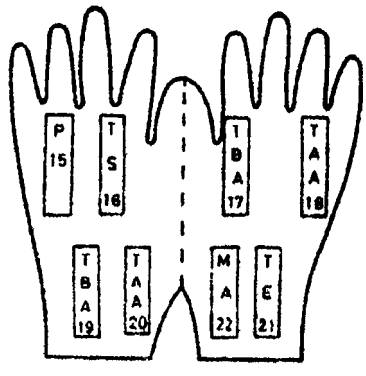
J-2.4.1 For subjecting to mechanical tests, the sub-sample shall be divided into groups of three gloves. The test specimens shall then be taken from .the glove in accordance with J-3.t and tested. A glove shall be considered as defective if any of the test specimen, taken and tested, fails. The lot shall be considered al satisfactory, if none of the gloves ia found defective.

J-3 SAMPLING POSITION

J-3.1 The sam.pling position for taking specimens for various tests shall be as shown in Fig. 3. The gloves shall be slit up outer finger side and laid with outside surface up for stamping cut test pieces. The number of test pieces and code for the various test pieces are indicated in Fig. 3 and Table 8.



GLOVE 1 GLOVE 2



GLOVE 3

FIO. 3 POSITIONS FOR STAMPING OUT TnT SPECIMENS FOI. MECHANICAL PROPERTIES

Table 8 Sampling Position
(*Clause* J-3.1)

SI No.	Properties to be Tested	Code for the Test Plec"	Test Piece No. as Indicated In Fig. 3	
			Front	Back
(1)	(2)	(3)	(4 ,	(5)
i)	Tensile strength and elongation at break before ageing	*TBA*	1.19	6,11,17
11)	Tensile strength and eloagauon at break after ageing	*TAA*	8,20	4,1418
iii)	Tension set	*P*	13,15	7
iv)	Tensile strength of 200 percent elongation	*TE*	2	10,21
v)	Tear strength	*TS*	5,16	3
vi)	Moisture absorption	*MA*	9,12	22
vii)	Puncture resistance	*PR*	23	24

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